filed. Rather, claims 12, 15, 17 and 19, as amended herein, simply omit repetitive language from intervening claims. The present amendments should therefore not be construed as an admission or concession that any rejection or objection in the January 15, 2002 Office Action is correct, or that any estoppel does or should arise. Applicants hereby provide public notice that applicants may assert the doctrine of equivalents with respect claims amended herein to the extent permitted under governing law.

**Rejection of Claims 7-19, 29 and 30 under 35 U.S.C. §112**

In the January 15, 2002 Office Action, claims 7-19, 29 and 30 were rejected for indefiniteness under 35 U.S.C. §112. The Office Action stated that the term "valve" was of uncertain meaning. The Office Action noted that the specification at page 10, lines 1-10, exemplifies titanium oxide as a type of "valve" metal, but that a "valve" metal was not satisfactorily defined. The Office Action assumed, however, that metal oxides in Group IVA qualified as "valve" metals.

Applicants submit that the Office Action overlooked another portion of the present specification that establishes that the term "valve metal" has a clear and recognized meaning to one of

ordinary skill in the art. In this regard, the specification states:

> A valve metal is defined as "one that is capable of forming a protective oxide coating when employed as the anode of an electrochemical cell" (Kirk-Othmer Encyclopaedia of Chemical Technology, Vol. 10, p. 248, 3rd Ed., J. Wiley & Sons, New York, 1980) but from an electrochemical point of view the following are the most appropriate: hafnium, niobium, tantalum, titanium, tungsten and zirconium.

(Specification at page 22, line 30 - page 23, line 8). Applicants therefore submit that, in view of the above-quoted definition of valve metal set forth in the present specification, claims 7-19, 29 and 30 satisfy the definiteness requirements of 35 U.S.C. §112.

The Office Action assumed that metal oxides in Group IVA of the periodic table, such as zirconium oxide, qualify as a "valve" metal. This assumption is correct with respect to the IUPAC form of the periodic table. Applicants wish to point out, however, that in the CAS version of the periodic table, the same group of metals is referred to as Group IVB. Such metals are still valve metals, regardless of the usage of a particular periodic table.

**Rejection of Claims 1, 3-11, 13, 14, 20-22, 33-34 and 40-42 under 35 U.S.C. §102(a) based upon the Narayanan '231 Patent**

In the January 15, 2002 Office Action, claims 1, 3-11, 13, 14, 20-22, 33-34 and 40-42 were rejected under 35 U.S.C. §102(a) as being anticipated by Narayanan et al. U.S. Patent No. 5,945,231. The Office Action acknowledged that the Narayanan '231 patent does not teach an improved tolerance to voltage reversal. (See Office Action at page 3.) Instead, the Office Action rejected the above-listed claims as being inherently anticipated by the Narayanan disclosure. Applicants submit, however, that Narayanan does not, and cannot, anticipate claims 1, 3-6, 8-11, 13, 14, 20-22, 33-34 and 40-42 as amended herein.

Amended claims 1 and 34 (and claims 3-6, 8-11, 13, 14, 20-22, 33 and 40-42, which depend directly or indirectly from claim 1) recite an anode for use in a fuel cell having improved tolerance to voltage reversal. The anode comprises a first catalyst composition for electrochemically oxidizing a fuel directed to the anode and a second catalyst composition for evolving oxygen from water. The second catalyst composition comprises a metal oxide selected from the group consisting of one or more precious metal oxides and combinations of precious metal oxide(s) with valve metal oxides.

The portions of the Narayanan '231 patent cited at page 3 of the Office Action do not disclose or suggest that Narayanan's catalyst is suitable for use as an anode catalyst. Indeed, the Office Action implicitly agreed that Narayanan's catalyst teachings apply more to cathodes (see Office Action at page 3, citing column 9 of the Narayanan '231 patent).

With respect to claim 33, there is an additional reason why the Narayanan '231 patent does not, and cannot, anticipate that claim. Claim 33 requires that the fuel stream comprises <u>gaseous</u> hydrogen. By contrast, the Narayanan's disclosed technique is shown only as applying to devices operating on <u>liquid</u> organic fuel (see, for example, claims 1 and 7 of the Narayanan '231 patent).

**Rejection of claims 1-3, 24, 25, 28 and 31-42 under**
**<u>35 U.S.C. §§102 and 103 based upon the Narayanan '721 Patent</u>**

In the January 15, 2002 Office Action, claims 1-3, 24, 25, 28 and 31-42 were rejected under 35 U.S.C. §102(e) as being anticipated by Narayanan et al. U.S. Patent No. 6,171,721. Claims 26, 27 and 29 were rejected under 35 U.S.C. §103 as being unpatentable for obviousness in view of the Narayanan '721 patent.

As discussed above, claims 1 and 34 have been amended so as to include the subject matter of former (now cancelled) claim 7. The January 15, 2002 Office Action set forth no rejection of claim 7 based upon the Narayanan '721 patent. Applicants therefore submit that claims 1 and 34, as well as claims 2-3, 24-29, 31-33 and 35-42 dependent thereon, as amended herein to include the limitations of former (now cancelled) claim 7, are patentably distinguished from the disclosure of the Narayanan '721 patent.

* * * * *

In view of the foregoing amendments and remarks, applicants submit that claims 1-6, 8-11, 13, 14, 20-22, 24-29 and 31-42 are allowable, in addition to claims 12, 15-19, 23 and 30 already indicated as being allowable. The Examiner is invited to telephone the applicants' undersigned attorney at (312) 775-8202 if any unresolved matters remain.

Please charge any fees incurred in connection with this submission to Deposit Account No. 13-0017.

Respectfully submitted,

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Dated: April 15, 2002

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231, on 4-15-2002
Date of Deposit

ROBERT W. FIESELER
Name of applicant, assignee, or Registered Representative

Signature

4-15-02
Date of Signature

## APPENDIX A

## VERSION WITH MARKINGS TO SHOW CHANGES MADE

1. An anode for use in a fuel cell having improved tolerance to voltage reversal, said anode comprising a first catalyst composition for electrochemically oxidizing a fuel directed to said anode and a second catalyst composition for evolving oxygen from water,[.]

wherein said second catalyst composition comprises a metal oxide selected from the group consisting of precious metal oxides, mixtures of precious metal oxides, solid solutions of precious metal oxides, mixtures of precious metal oxides and valve metal oxides, and solid solutions of precious metal oxides and valve metal oxides.

12. [The anode of claim 10] An anode for use in a solid polymer electrolyte fuel cell having improved tolerance to voltage reversal, said anode comprising a first catalyst composition for electrochemically oxidizing a fuel directed to said anode and a second catalyst composition for evolving oxygen from water, said second catalyst composition comprising a metal oxide,

wherein said metal oxide comprises a solid solution of $RuO_2$ and $IrO_2$ having iridium present in an atomic ratio of ruthenium to iridium of no greater than 90:10.

15. **[The anode of claim 14]** **An anode for use in a solid polymer electrolyte fuel cell having improved tolerance to voltage reversal, said anode comprising a first catalyst composition for electrochemically oxidizing a fuel directed to said anode and a second catalyst composition for evolving oxygen from water, said second catalyst composition comprising a metal oxide, and**

wherein said metal oxide comprises a solid solution of $RuO_2$ and $TiO_2$.

16. **The anode of claim [14]** **15** wherein said metal oxide comprises a solid solution of $RuO_2$ and $TiO_2$ having titanium present in an atomic ratio of ruthenium to titanium of no greater than 50:50.

17. **[The anode of claim 14]** **An anode for use in a solid polymer electrolyte fuel cell having improved tolerance to voltage reversal, said anode comprising a first catalyst composition for electrochemically oxidizing a fuel directed to said anode and a second catalyst composition for evolving oxygen from water, said second catalyst composition comprising a metal oxide,**

**wherein said metal oxide comprises a solid solution of $RuO_2$ and a valve metal oxide, and**

wherein said solid solution has titanium present in an atomic ratio of ruthenium to titanium of no greater than 70:30.

18. **The anode of claim [14]** 17 wherein said solid solution has titanium present in an atomic ratio of ruthenium to titanium of no greater than 90:10.

19. **[The anode of claim 13]** **An anode for use in a solid polymer electrolyte fuel cell having improved tolerance to voltage reversal, said anode comprising a first catalyst composition for electrochemically oxidizing a fuel directed to said anode and a second catalyst composition for evolving oxygen from water, said second catalyst composition comprising a metal oxide, and**

wherein said metal oxide comprises a solid solution of $IrO_2$ and $TiO_2$ having titanium present in an atomic ratio of iridium to titanium of no greater than 90:10.

30. **The anode of claim [29]** 1, **said second catalyst composition comprising a metal oxide, and**

**wherein said second catalyst composition is supported on [wherein said valve metal oxide support is]** a titanium oxide.

34. A method of making a solid polymer electrolyte fuel cell tolerant to voltage reversal, said fuel cell comprising an anode, a cathode, and a solid polymer electrolyte, said anode comprising a

first catalyst composition for electrochemically oxidizing a fuel directed to said anode, said method comprising incorporating a second catalyst composition in said anode for evolving oxygen from water,

**wherein said second catalyst composition comprises a metal oxide selected from the group consisting of precious metal oxides, mixtures of precious metal oxides, solid solutions of precious metal oxides, mixtures of precious metal oxides and valve metal oxides, and solid solutions of precious metal oxides and valve metal oxides**.